

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-177466
(43)Date of publication of application : 09.07.1996

(51)Int.Cl.

F01N 3/08
F01N 3/10
F01N 3/24
F01N 3/28
F01N 3/28
F01N 7/08

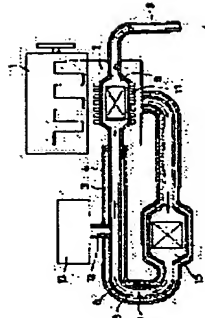
(21)Application number : 08-324502 (71)Applicant : COSMO SOGO KENKYUSHO:KK
COSMO OIL CO LTD
(22)Date of filing : 27.12.1994 (72)Inventor : MIYAMOTO KATSUMI
TABATA MITSUNORI
YOSHINARI TOMOHIRO

(54) HEAT EXCHANGING-TYPE DENITRATION DEVICE FOR DIESEL ENGINE

(57)Abstract:

PURPOSE: To maintain the stable denitration performance for a long time by constituting a first reaction part of a first reducing catalyst in an exhaust gas guide pipe of an inner pipe of a double pipe provided inside an exhaust manifold, and constituting a second reaction part of a second reducing catalyst in the exhaust gas pipe outside the exhaust manifold.

CONSTITUTION: A double pipe 3 whose outer pipe is formed into a loop shape is provided from an exhaust manifold 2 to the outside, the space between the outer and inner pipes 4, 5 are taken as a communication passage 6 for exhaust gas, communicated with an exhaust manifold 2, and the inner pipe 5 of the double pipe 3 is taken as an exhaust gas guide pipe 7. A first reaction part 9 provided with a first reducing catalyst for reducing dinitrogen monoxide to nitrogen is constituted in the exhaust gas guide pipe 7, and a second reaction part 10 provided with a second reducing catalyst for reducing nitrogen oxide to dinitrogen monoxide is constituted in the exhaust guide pipe 7 outside the exhaust manifold 2. A reducing agent supplying pipe 12 is connected between the second reaction part 10 and the first reaction part 9, and a soot and dust combustion catalyst 11 is attached on the outer peripheral surface of the exhaust gas guide pipe 7 of the first reaction part 9.



LEGAL STATUS

[Date of request for examination]
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than

the examiner's decision of rejection or
application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision
of rejection]
[Date of requesting appeal against examiner's
decision of rejection]
[Date of extinction of right]

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] While an outer tube forms a loop-formation-like double pipe in the exterior from the exhaust manifold of a diesel power plant and making between an outer tube and inner tubes into the circulation way of the exhaust gas which is open for free passage to the above-mentioned exhaust manifold Use the inner tube of this double pipe as exhaust gas guidance tubing, and it forms in the exhaust pipe prolonged in the exterior of an exhaust manifold through the interior of an exhaust manifold from this exhaust gas guidance tubing. While making the 1st reduction catalyst which returns a dinitrogen oxide to nitrogen in the above-mentioned exhaust gas guidance tubing inside the above-mentioned exhaust manifold have and constituting in the 1st reaction section The 2nd reduction catalyst which returns nitrogen oxides to a dinitrogen oxide in said exhaust gas guidance tubing in the exterior of said exhaust manifold is made to have. While connecting the reducing-agent supply pipe which constitutes in the 2nd reaction section and supplies a reducing agent to said exhaust gas guidance tubing between said 1st reaction section and reaction sections of the above 2nd The heat exchange mold denitrification plant for diesel power plants characterized by coming to attach a soot dust combustion catalyst in the peripheral face of the 1st reaction section of said exhaust gas guidance tubing.

[Translation done.]

* NOTICES *

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. *** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the heat exchange mold denitrification plant for diesel power plants which it not only carries out reduction removal of the nitrogen oxides in the exhaust gas from a diesel power plant, but can reduce the hydrocarbon contained in exhaust gas, an oxygenated organic compound, a carbon monoxide, soot dust, etc.

[0002]

[Description of the Prior Art] Since it is very harmful also to the body, it is strongly requested from exhaust gas that the amount should be reduced, conventionally, various denitrification plants are proposed and the nitrogen oxides which are the environmental pollutants contained in exhaust gas from a diesel power plant are developed. For example, prepare the injection valve of a reducing agent in the flue outlet of cylinder cover, while installing a nitrogen-oxides reduction catalyst in the interior of an exhaust manifold with the temperature of the exhaust gas from a diesel power plant high enough, synchronizing with the hot exhaust gas discharged from each cylinder, throw in a reducing agent, and often mix a reducing agent with exhaust gas to JP,6-50133A, and it is made to pass a catalyst, and the denitrification plant for diesel power plants which held comparatively high temperature on the front face of a catalyst in this way is proposed. Nitrogen oxides can fully be returned on a catalyst, without causing the problem of lock out of a catalyst, since the reaction of the ammonia (or an ammonia derivative like a urea) used as a reducing agent and the sulfur content in a fuel stops being able to happen easily according to this equipment.

[0003]

[Problem(s) to be Solved by the Invention] In the Prior art, in order to acquire temperature required in this way to return nitrogen oxides, the temperature of exhaust gas prepares a catalyst in the interior of the highest exhaust manifold (350-400 degrees C), and is returning nitrogen oxides. However, in this way, when exposing to the interior of an exhaust manifold as it is and preparing a catalyst in it, a catalyst heat-deteriorates with hot exhaust gas, and soot dust adheres to a catalyst, and since it is directly influenced of vibration of an engine etc., there is fear of a catalyst being damaged further. And when 10,001, thus a catalyst are damaged, the fragment hits an exhaust gas turbine directly, a turbine is damaged, and there is a danger of causing engine loss of power, a halt of an engine, etc. Moreover, the soot dust itself adheres to a catalyst and an exhaust air pressure loss may increase.

[0004] This invention avoids beforehand the various failures by breakage of a nitrogen-oxides reduction catalyst etc. which mentioned above, and aims at offering the heat-exchange mold denitrification plant for diesel power plants which can maintain the denitrification engine performance stabilized over the long period of time, without having been made in order to solve various problems in the conventional denitrification plant for diesel power plants which were mentioned above, and causing increase of ***** and the exhaust-air pressure loss by adhesion of the soot dust to a catalyst.

[0005]

[Means for Solving the Problem] The heat exchange mold denitrification plant for diesel power

plants by this invention While an outer tube forms a loop-formation-like double pipe in the exterior from the exhaust manifold of a diesel power plant and making between an outer tube and inner tubes into the circulation way of the exhaust gas which is open for free passage to the above-mentioned exhaust manifold Use the inner tube of this double pipe as exhaust gas guidance tubing, and it forms in the exhaust pipe prolonged in the exterior of an exhaust manifold through the interior of an exhaust manifold from this exhaust gas guidance tubing. While making the 1st reduction catalyst which returns a dinitrogen oxide to nitrogen in the above-mentioned exhaust gas guidance tubing inside the above-mentioned exhaust manifold have and constituting in the 1st reaction section The 2nd reduction catalyst which returns nitrogen oxides to a dinitrogen oxide in said exhaust gas guidance tubing in the exterior of said exhaust manifold is made to have. It constitutes in the 2nd reaction section, and while connecting the reducing-agent supply pipe which supplies a reducing agent to said exhaust gas guidance tubing between said 1st reaction section and reaction sections of the above 2nd, it is characterized by coming to attach a soot dust combustion catalyst in the peripheral face of the 1st reaction section of said exhaust gas guidance tubing.

[0006] Based on drawing 1 which shows one example below, the heat exchange mold denitrification plant for diesel power plants by this invention is explained to a detail. [0007] In the heat exchange mold denitrification plant for diesel power plants by this invention, an outer tube forms the loop-formation-like double pipe 3 in the exterior from the inner tube 5 manifold 2 of a diesel power plant 1, and while making between the outer tube 4 and inner tube 5 into the circulation way 6 of the exhaust gas which is open for free passage to the above-mentioned exhaust manifold, let the inner tube of the above-mentioned double pipe be the exhaust gas guidance tubing 7. This exhaust gas guidance tubing is formed in the exhaust pipe 8 prolonged in the exterior of an exhaust manifold through the interior of an exhaust manifold. The circulation way of the above-mentioned exhaust gas is open for free passage to the exhaust manifold, heat exchange of the exhaust gas from a diesel power plant is carried out to the 1st and 2nd reaction sections constituted in exhaust gas guidance tubing, and it gives necessary reaction temperature to these [1st] and the 2nd reaction section so that it may circulate and this circulation way may be mentioned later.

[0008] While making the 1st reduction catalyst which returns a dinitrogen oxide to nitrogen in the above-mentioned exhaust gas guidance tubing inside the above-mentioned exhaust manifold have and constituting in the 1st reaction section 9, the 2nd reduction catalyst which returns nitrogen oxides to a dinitrogen oxide in said exhaust gas guidance tubing in the exterior of said exhaust manifold is made to have, and it constitutes in the 2nd reaction section 10.

[0009] The 2nd reduction catalyst of the 2nd reaction section consists of platinum, and returns the nitrogen oxides in the exhaust gas from a diesel power plant mainly to a dinitrogen oxide. The 1st reduction catalyst of the 1st reaction section consists of noble metals or a base-metal oxide, and returns the exhaust gas from the 2nd reaction section which mainly contains a dinitrogen oxide as ***** to nitrogen under existence of a reducing agent. About the 1st and 2nd reduction catalysts, it mentions later.

[0010] Therefore, the 1st reaction section is arranged in the interior of an exhaust manifold with the highest temperature of the exhaust gas from a diesel power plant (350-400 degrees C). Furthermore, in the peripheral face of exhaust gas guidance tubing, the soot dust which the soot dust combustion catalyst 11 is attached and is contained in exhaust gas from a diesel power plant burns by contact for this soot dust combustion catalyst. As for this dust combustion catalyst, it is desirable to be formed in the peripheral face of exhaust gas guidance tubing which constitutes the 1st reaction section for example, in the shape of a fin.

[0011] In this way, according to the equipment of this invention, reaction temperature (200-700 degrees C, preferably 300-500 degrees C) required for the 1st reaction section which returns a dinitrogen oxide to nitrogen is given by the exhaust gas from a diesel power plant, and the heat of combustion of the above-mentioned soot dust. Moreover, since doing in this way, and the soot dust contained in exhaust gas burning, and adhering to the 1st reaction section is lost, the effectiveness of the heat exchange of exhaust gas and the 1st reaction section is highly maintainable.

[0012] Moreover, the 2nd reaction section is also prepared in exhaust gas guidance tubing, and necessary reaction temperature (150–500 degrees C, preferably 200–400 degrees C) is given by the exhaust gas which circulates said emission path.

[0013] Thus, in the heat exchange mold denitrification plant by this invention, since expose a catalyst, and it is not arranged in the interior of an exhaust manifold but it prepares in exhaust gas guidance tubing, a rapid thermal shock, adhesion of soot dust, etc. to a catalyst can be avoided, and the endurance of a catalyst can be raised.

[0014] According to this invention, the reducing-agent supply pipe 12 is connected to between said 2nd reaction section and the 1st reaction section (i.e., the downstream of the 2nd reaction section and the upstream of the 1st reaction section) into said exhaust gas guidance tubing, and a reducing agent which is mentioned later is supplied into exhaust gas. This reducing-agent supply pipe adds a reducing agent to the exhaust gas in exhaust gas guidance tubing from the proper reducing-agent feeder 13. Thus, as the exhaust gas which was able to add the reducing agent was led to the 1st reaction section and mentioned above, a dinitrogen oxide is returned to nitrogen. In order to mix this reducing agent and exhaust gas to homogeneity, a proper baffle (not shown) may be installed in tubing between a reducing-agent supply pipe and the 1st reaction section.

[0015] Therefore, according to such a denitrification plant, as in conventional equipment The exhaust gas (350–400 degrees C) from a hot diesel power plant does not contact a catalyst bed directly, and, moreover, the heat of combustion by hot exhaust gas and combustion of dust is used. Reaction temperature required for the 1st reaction section can be secured, and the direct heat deterioration by the hot exhaust gas to a catalyst does not happen, soot dust does not adhere to a catalyst, but the endurance of a catalyst improves sharply in this way.

[0016] In this invention, although especially the ingredient for constituting a double pipe, the reaction section, a baffle, etc. is not restricted, as for the 1st and 2nd reaction sections, it is desirable to constitute from 11 – 13Cr system ferrite stainless steel networks (for example, SUH409, SUS410L, etc.).

[0017] In this invention, the 1st reduction catalyst used for the 1st reaction section To the honeycomb-like support of the porosity which consists of an activated alumina, a silica, a zirconia, etc. Noble metals, such as platinum, palladium, and a ruthenium, a lanthanum, a cerium, copper, the catalyst component of perovskite mold crystal structure objects, such as base-metal oxide, such as iron and molybdenum, a 3 cobalt-oxide lanthanum, a 3 ferrous-oxide lanthanum, and 3 ferrous-oxide cobalt strontium, — independent — or the thing which it makes it come combining two or more sorts of mixture to support is used.

[0018] The amount of support of these catalyst components is usually 0.1 – 1.0% of the weight of the range preferably 0.01 to 5.0% of the weight to support with noble metals. In a base-metal oxide, it is usually 20 – 40% of the weight of the range preferably 5.0 to 70% of the weight to support.

[0019] The thing which made platinum support in 0.3 – 0.7% of the weight of the range by the sinking-in method preferably 0.1 to 1.0% of the weight is used on the honeycomb support which the 2nd reduction catalyst used for the 2nd reaction section becomes from high-purity-alumina powder with few impurities, such as alkali metal and alkaline earth metal.

[0020] Furthermore, a soot dust combustion catalyst considers as the structure which makes it come in 0.3 – 0.7% of the weight of the range preferably 0.1 to 1.0% of the weight, respectively to support platinum and a bismuth, and attaches this in the support which consists of a metal preferably formed in the shape of a fin at the peripheral face of exhaust gas guidance tubing which constitutes the 1st reaction section. What is usually called the metal mesh filter which consists of an aluminum special plating ferrite stainless steel network as the above-mentioned metal support here can be used preferably.

[0021] In the equipment of this invention, the range of 200–700 degrees C of catalytic-reaction temperature in the 1st reaction section is usually 300–500 degrees C preferably, and the range of 150–500 degrees C of catalytic-reaction temperature in the 2nd reaction section is usually 200–400 degrees C preferably. moreover, the space velocity (SV) in the 1st reaction section — usually — 20000–150000hr⁻¹ and space velocity [in / it is the range of 50000–100000hr⁻¹

preferably, and / the 2nd reaction section] (SV) — usually — 10000–250000hr⁻¹ — it is the range of 20000–100000hr⁻¹ preferably.

[0022] In this invention, a hydrocarbon and an oxygenated organic compound are preferably used as a reducing agent. As a hydrocarbon, in a gas-like thing, methane, ethane, ethylene, a propane, a propylene, butane, a butylene, etc. can be mentioned, for example, and mineral oil system hydrocarbon oils, such as a hydrocarbon of single components, such as a pentane, a hexane, a heptane, an octane, octene, benzene, toluene, and a xylene, and a gasoline, kerosene, gas oil, a fuel oil, are mentioned by the liquid-like thing.

[0023] Moreover, as an oxygenated organic compound, ketones, such as ester, such as ether, such as alcohols, such as methyl alcohol, ethyl alcohol, propyl alcohol, and octyl alcohol, wood ether, diethylether, and dipropyl ether, methyl acetate, ethyl acetate, and fats and oils, an acetone, and a methyl ethyl ketone, can be mentioned, for example, these hydrocarbons and oxygenated organic compounds — independent — it is — 2 [or] — it is used as two or more sorts of mixture. Furthermore, one or more sorts of a hydrocarbon and one or more sorts of an oxygenated organic compound may be used together.

[0024] On the occasion of denitrification processing of the exhaust gas from the diesel power plant by the equipment of this invention, a hydrocarbon, the oxygenated organic compound or the so-called particulates as un-burning thru/or the incomplete combustion product of the fuel in the exhaust gas from a diesel power plant, etc. is effective as a reducing agent, and these unburnt glow thru/or incomplete combustion product contained in exhaust gas some reducing agents or by supposing all and using in these, and particulates can be removed efficiently.

[0025] Thus, using effectively the heat which the exhaust gas from a diesel power plant has by combining as the 1st reaction section and the 2nd reaction section were mentioned above according to this invention, it can be efficient and the nitrogen oxides contained in the exhaust gas can be returned to nitrogen and water.

[0026] In the 2nd reaction section, it sets at low temperature comparatively using the catalyst which makes alumina support come to support platinum. Namely, preferably in 200–400 degrees C, the nitrogen oxides contained in exhaust gas are returned mainly to a dinitrogen oxide.

Subsequently it sets in the 1st reaction section which can secure higher reaction temperature. Preferably in 300–500 degrees C, catalytic-reduction processing of the above-mentioned dinitrogen oxide is carried out under existence of a reducing agent at nitrogen using said catalyst. In this way Since nitrogen oxides are gradually returned using a suitable nitrogen-oxides reduction catalyst which has high activity with the reaction temperature according to the reaction temperature obtained, reduction removal of the nitrogen oxides contained in exhaust gas can be carried out efficiently.

[0027] Furthermore, according to this invention, in the soot dust which is the unburnt glow product contained in exhaust gas, a carbon monoxide, hydrocarbons, an oxygenated organic compound, etc., a considerable amount burns to water and a carbon dioxide according to said soot dust combustion catalyst (oxidation). And since it is finally consumed as a reducing agent for returning a nitrogen dioxide to nitrogen in the 1st reaction section when combustion of unburnt glow products, such as soot dust, is inadequate and it flows to the downstream with exhaust gas, as for unburnt glow products, such as soot dust, most is removed from exhaust gas as a result.

[0028]

[Example] Although an example is given to below and this invention is explained to it, this invention is not limited at all by these examples.

[0029] (Preparation of the catalyst used for the 1st reaction section) Impurities, such as alkali metal and alkaline earth metal, manufactured honeycomb-like support from little high-purity-alumina powder, this support was made to support palladium, platinum, oxidation copper, or molybdenum oxide with the sinking-in method 0.5% of the weight, and a catalyst A-1 (palladium), A-2 (platinum), A-3 (copper), and A-4 (molybdenum) were prepared. (Preparation of the catalyst used for the 2nd reaction section) The honeycomb-like support which consists of high-purity-alumina powder was made to support platinum with the sinking-in method 0.5% of the weight, and the catalyst B-1 was prepared.

(Preparation of a soot dust combustion catalyst) Made the metal mesh filter into support, this was made to support platinum and a bismuth by a unit of 0.5% of the weight, respectively, and the catalyst C-1 was prepared.

[0030] an example 1 (performance evaluation test of a denitrification plant) -- the evaluation trial of the denitrification engine performance by diesel-power-plant real exhaust gas was performed on the following conditions about the equipment of this invention equipped with A-4, B-1, and C-1 from said catalyst A-1.

[0031] The elimination factor of the nitrogen oxides in exhaust gas measured each nitrogen-oxides concentration in the exhaust gas of the entry of the 2nd reaction section, and the exhaust gas of the outlet of the 1st reaction section, and asked for it in [(nitrogen-oxides concentration in entry of the 2nd reaction section - nitrogen-oxides concentration in outlet of the 1st reaction section) / (nitrogen-oxides concentration in entry of the 2nd reaction section)] x100(%).

[0032] (A) Test condition (1) The test condition of a diesel power plant, and presentation engine specification of real exhaust gas 4200 cc direct injection diesel-power-plant use fuel Gas oil (about 0.2 % of the weight of sulfur contents)

Engine speed 2000rpm engine load 10 - 25kgm dust discharge About 80-130mg/[Nm] 3 carbon monoxide A 180-250 ppm carbon dioxide 5 - 8% oxygen 11 - 15% total hydrocarbon 300-500 ppm nitrogen oxides A 250-750 ppm sulfur oxide 25-40 ppm water 6 - 8% (2) The reaction section of space velocity 1st 50000hr-1 -- 2nd reaction section 20000hr-1 (3) The reaction section of reaction temperature 1st 300 degrees C, 350 degrees C, or 400 degrees C -- the 2nd reaction section 200 degrees C, 250 degrees C, or 300-degree-C (4) test time 10 hours [0033] (B) Using the reducing agent shown in the trial result table 1, 1000-3000 ppm added to diesel-power-plant real exhaust gas, and catalytic reduction of the nitrogen oxides was carried out under said exhaust gas presentation. A result is shown in Table 1.

[0034]

[Table 1]

第1反応部の触媒	還元剤	窒素酸化物の還元率への転化率 (%)			
		反 応 温 度 (第1反応部/第2反応部、℃/℃)			
		300/200	350/250	400/300	
A-1	プロピレン	56.3	72.3	67.8	
	プロパン	51.4	66.3	62.4	
	メタン	52.5	58.6	60.2	
A-2	プロピレン	52.2	64.5	63.3	
	プロパン	41.8	60.7	57.7	
	メタン	43.3	53.7	55.4	
A-3	プロピレン	18.6	32.4	34.8	
	プロパン	15.6	28.7	30.7	
	メタン	13.9	25.5	28.4	
A-4	プロピレン	22.5	31.2	35.4	
	プロパン	17.3	27.6	30.7	
	メタン	18.0	25.6	28.8	

[0035] (C) The elimination factor of dust combustion test dust measured the amount of soot dust in an exhaust manifold (A), and the amount of soot dust in an exhaust pipe (B), and calculated and calculated them by [(A-B) / type A] x100(%). A result is shown in Table 2.

[0036]

[Table 2]

経過時間 (hr)	1	2	3	5
燃焼除去率 (%)	51.2	50.8	52.5	51.6

経過時間 (hr)	7	8	10
燃焼除去率 (%)	50.9	49.7	51.7

[0037] The result of having examined is shown in Table 3 using the catalyst A-1 which arranged the 2nd reaction section and 1 reaction section of ** in this sequence behind the exhaust pipe (lower stream of a river) of the example of comparison 1 exhaust-manifold exterior, and showed high activity in the example 1, the combination of B-1 and a catalyst A-2, and the combination of B-1. Test conditions are an example 1 and ** except for the catalytic-reaction temperature in the 1st reaction section.

[0038]

[Table 3]

第1反応部の触媒	還元剤	窒素酸化物の還元率への転化率 (%)			
		反 応 温 度 (第1反応部/第2反応部、℃/℃)			
		165/200	218/250	234/300	
A-1	プロピレン	3.2	8.5	15.3	
	プロパン	3.0	8.2	12.6	
	メタン	2.4	8.3	13.0	
A-2	プロピレン	5.7	12.2	16.3	
	プロパン	5.1	13.5	14.7	
	メタン	3.8	11.8	13.6	

[0039] According to this approach, since sufficient reaction temperature cannot be obtained in the 1st reaction section as compared with the approach of this invention, the invert ratio to the nitrogen of nitrogen oxides is remarkably low.

[0040]

[Effect of the Invention] As mentioned above, the heat exchange mold denitrification plant for diesel power plants by this invention The double pipe which is open for free passage to this is formed in the exterior from the exhaust manifold of a diesel power plant. While using the inner tube of this double pipe as exhaust gas guidance tubing, making the 1st reduction catalyst which returns a dinitrogen oxide to nitrogen in the above-mentioned exhaust gas guidance tubing inside an exhaust manifold have and constituting in the 1st reaction section The 2nd reduction catalyst which returns nitrogen oxides to a dinitrogen oxide in said exhaust gas guidance tubing in the exterior of said exhaust manifold is made to have, and it has the description important for the point constituted in the 2nd reaction section.

[0041] Therefore, according to the denitrification plant by this invention, as in conventional equipment By heat exchange with the 1st reaction section equipped with the catalyst using the heat of reaction which hot exhaust gas (350-400 degrees C) does not contact a reduction catalyst directly, and moreover generates by hot exhaust gas and dust combustion Since the temperature (before or after 350 degrees C) of the catalytic reaction to need can be acquired, the direct heat deterioration by the elevated-temperature exhaust gas to a catalyst does not happen, soot dust etc. does not adhere to a catalyst, but the endurance of a catalyst improves sharply in this way.

[0042] Furthermore, since required reaction temperature is 200-250 degrees C in the 2nd

reaction section and it can arrange in the latter part of an exhaust gas turbine, there is also no fear of breakage of an exhaust gas turbine, and it can use also for a diesel power plant with a turbocharger in this way. Furthermore, as mentioned above in exhaust gas guidance tubing in the flow direction of exhaust gas, while arranging and combining the 1st reaction section and the 2nd reaction section in this way according to this invention Using effectively the temperature of exhaust gas, and the combustion temperature in a soot dust combustion catalyst by attaching a dust combustion catalyst in the peripheral face of the 1st reaction section The hydrocarbons besides soot dust and carbon monoxides etc. which are the non-burned object of not only the nitrogen oxides contained in exhaust gas but a fuel are well removable.

[Translation done.]

* NOTICES *

JP0 and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the important section sectional view showing one example of the heat exchange mold denitrification plant for diesel power plants by ** and this invention.

[Description of Notations]

1 [-- An outer tube, 5 / -- An inner tube, 6 / -- The circulation way of exhaust gas 7 / -- Exhaust gas guidance tubing, 8 / -- An exhaust pipe, 9 / -- The 1st reaction section, 10 / -- The 2nd reaction section, 11 / -- A soot dust combustion catalyst, 12 / -- A reducing-agent supply pipe, 13 / -- Reducing-agent feeder.] -- A diesel power plant, 2 -- An exhaust manifold, 3 -- A double pipe, 4

[Translation done.]

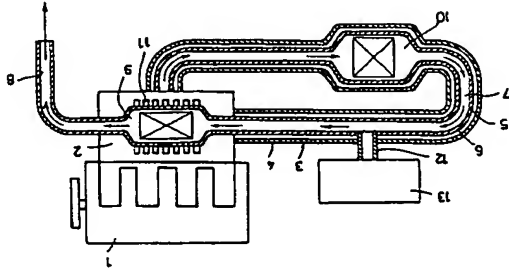
(51)Int.Cl. ⁴	識別記号	庁内整理番号	P I	技術的効果
F 0 1 N	3/08	2 A B B		
	3/10	2 A B Z		
	3/24	2 A B C		
	3/28	2 A B		
		3 0 1 C		
審査請求 未請求 請求項の数1 O L (全 7 頁) 最終頁に続く				
(21)出願番号	特開平6-324502	(71)出願人	000130189	
		株式会社コスモ総合研究所		
(22)公開日	平成6年(1994)12月27日	東京都港区芝浦1丁目1番1号		
		(71)出願人	000105587	
		コスモ石油株式会社		
		東京都港区芝浦1丁目1番1号		
		(72)発明者	宮本 勝見	
		埼玉県草市市権現堂1134-2 株式会社コ		
		スモ総合研究所研究開発センター内		
		(72)発明者	田畑 光記	
		埼玉県草市市権現堂1134-2 株式会社コ		
		スモ総合研究所研究開発センター内		
		(74)代理人	弁理士 牧野 豊彦	最終頁に続く

(54)【発明の名称】 ディーゼルエンジン用熱交換型脱炭装置

(57)【要約】 (修正有)

【目的】 排ガス中の窒素酸化物を還元除去するのみならず、排ガスに含まれる炭化水素、一酸化炭素、炭塵等を低減することができるディーゼルエンジン用熱交換型脱炭装置の提供。

【構成】 ディーゼルエンジン1の排気マニホールド2から外部に二重管3を設け、外管4と内管5の間を排気マニホールド2に連通する排ガスの流通路6とすると共に、二重管の内管を排ガス案内管7とし、排ガス案内管から排気マニホールドの内部を経て外部に延びる排気管8に形成し、排気マニホールドの内部で排ガス案内管に一般化二重管を並列に連通する第1の還元触媒を有する第1の反応部9を構成すると共に、排気マニホールドの外部で排ガス案内管内に窒素酸化物を一酸化二窒素に還元する第2の還元触媒を有する第2の反応部10を構成し、第1と第2の反応部の間に排ガス案内管内に還元触媒を有する還元供給管12を接続すると共に、排ガス案内管の第1の反応部の外面に燃焼燃焼触媒11を設ける。



【特許請求の範囲】

【請求項1】 ディーゼルエンジンの排気マニホールドからその外部に外管がループ状の二重管を設け、外管と内管との間を上記排気マニホールド下に通する排ガス案内管と通路とすると共に、この二重管の内管を排ガス案内管とし、この排ガス案内管から排気マニホールドの内部を経て排気マニホールドの外部に延びる排気管に形成し、上記排気マニホールドの内部で上記排ガス案内管に一般化二重管を並列に連通する第1の還元触媒を有せしめて、第1の反応部に構成すると共に、前記排気マニホールドの外部で前記排ガス案内管内に窒素酸化物を一酸化二窒素に還元する第2の還元触媒を有せしめて、第2の反応部に構成し、前記第1の反応部と上記第2の反応部の間に前記排ガス案内管内に還元触媒を供給する還元供給管を接続すると共に、前記排ガス案内管の第1の反応部の外面に燃焼燃焼触媒を取付けてなことを特徴とするディーゼルエンジン用熱交換型脱炭装置。

【発明の詳細な説明】

【0001】
【産業上の利用分野】 本発明は、ディーゼルエンジンからの排ガス中の窒素酸化物を還元除去するのみならず、排ガスに含まれる炭化水素、含炭素有機化合物、一酸化炭素、炭塵等をも低減することができるディーゼルエンジン用熱交換型脱炭装置に関する。

【0002】

【従来の技術】 ディーゼルエンジンからの排ガスに含まれる炭塵汚染物質である窒素酸化物は、人体にも非常に有害であることから、排ガスからその量を低減することが強く要請されており、従来、種々の脱炭装置が提案され、開発されている。例えば、特開平6-50133号公報には、ディーゼルエンジンからの排ガスの温度が十分に高い排気マニホールドの内部に窒素酸化物還元触媒を設けると共に、シリンドラカーの排気出口に還元触媒の排ガスに同期して還元剤を投入し、排ガスと還元剤をよく混合して触媒を通過させ、かくして、触媒の表面上で比較的高い温度を保持するようにしたディーゼルエンジン用脱炭装置が提案されている。この装置によれば、還元剤として用いるアンモニア（又は尿素のようなアンモニア誘導体）と燃料中の硫黄分との反応が速く、低くなるので、触媒の劣化という問題を引き起こすことなく、触媒上で十分に窒素酸化物を還元することができ

【0003】

【発明が解決しようとする課題】 従来の技術では、このように、窒素酸化物を還元するのに必要な温度を得るために、排ガスの温度が高くない排気マニホールドの内部（350～400℃）に触媒を設けて、窒素酸化物を還元している。しかし、このように、排気マニホールドの内部に触媒をそのまま、露出して設けるときは、高温の

排ガスによって触媒が熱劣化し、また、触媒が触媒に付着し、更に、エンジンの振動等の影響を直接受けるため、触媒が破損する等の恐れがある。そして、万一、このようにして、触媒が破損した場合には、その破片が排気タービンを通過し、タービンを破損して、エンジン出力低下やエンジンの停止等を起こす危険性がある。また、触媒自体が触媒に付着して、排気圧が増大することもあり得る。

【0004】 本発明は、従来のディーゼルエンジン用脱炭装置における上述したような種々の問題を解決するためになされたものである。触媒への触媒の付着による排気圧の増大を招くことなく、窒素酸化物還元触媒の破損等による上述した種々の問題を未然に回避して、長期間にわたって安定した脱炭性能を維持することができ、ディーゼルエンジン用熱交換型脱炭装置を提供することを目的とする。

【0005】

【課題を解決するための手段】 本発明によるディーゼルエンジン用熱交換型脱炭装置は、ディーゼルエンジンの排気マニホールドからその外部に外管がループ状の二重管を設け、外管と内管との間を上記排気マニホールドに通する排ガスの流通路とすると共に、この二重管の内管を排ガス案内管とし、この排ガス案内管から排気マニホールドの内部を経て排気マニホールドの外部に延びる排気管に形成し、上記排気マニホールドの内部で上記排ガス案内管内に一般化二重管を並列に連通する第1の還元触媒を有せしめて、第1の反応部に構成すると共に、前記排気マニホールドの外部で前記排ガス案内管内に窒素酸化物を一酸化二窒素に還元する第2の還元触媒を有せしめて、第2の反応部に構成し、前記第1の反応部と上記第2の反応部の間に前記排ガス案内管内に還元触媒を供給する還元供給管を接続すると共に、前記排ガス案内管の第1の反応部の外面に燃焼燃焼触媒を取付けてなことを特徴とする。

【0006】 以下に一実施例を示す図1に基づいて、本発明によるディーゼルエンジン用熱交換型脱炭装置を詳細に説明する。

【0007】 本発明によるディーゼルエンジン用熱交換型脱炭装置においては、ディーゼルエンジン1の排気マニホールド2からその外部に外管がループ状の二重管3を設け、その外管4と内管5の間を上記排気マニホールドに通する排ガスの流通路6とすると共に、上記二重管の内管を排ガス案内管7とする。この排ガス案内管は、排気マニホールドの内部を経て排気マニホールドの外部に延びる排気管8に形成されている。上記排ガスの流通路は、排気マニホールドに通しており、ディーゼルエンジンからの排ガスは、この流通路を流し、後述するように、排ガス案内管内に構成した第1及び第2の反応部と給炭管12とを構成し、これら第1及び第2の反応部に所収の反応温度を与える。

7

窒素酸化物 250~750 ppm
炭化酸化物 25~40 ppm
水 6~8 %
(2) 空間速度 5000.0 hr⁻¹
第1の反応部 2000.0 hr⁻¹
第2の反応部 3000.0 hr⁻¹
(3) 反応温度 300℃、350℃又は400℃
第1の反応部

第2の反応部 200℃、250℃又は300℃
(4) 試験時間 10時間
【0033】(B) 試験結果
表1に示す還元剤を用いて、ディーゼルエンジン裏排ガスに1000~3000 ppm添加して、前記排ガス組成下で窒素酸化物を接触還元した。結果を表1に示す。
【0034】
【表1】

第1反応部の触媒	還元剤	窒素酸化物の還元率(%)			
		300/200	350/250	400/300	反応温度(℃)
A-1	プロピレン	56.3	72.3	67.8	15.3
	プロパン	51.4	66.3	62.4	
	メタン	52.5	58.6	60.2	
A-2	プロピレン	52.2	64.5	63.3	12.6
	プロパン	41.8	60.7	57.7	
	メタン	43.3	53.7	56.4	
A-3	プロピレン	18.6	32.4	34.8	8.5
	プロパン	15.6	28.7	30.7	
	メタン	13.9	25.5	28.4	
A-4	プロピレン	22.5	31.2	35.4	2.4
	プロパン	17.3	27.6	30.7	
	メタン	18.0	25.6	28.8	

【0035】(C) 燃焼試験

燃焼の除去率は、排気マニホールド内の燃焼温度(A)と

排気管内の燃焼温度(B)とを測定し、式((A-B)/

A) × 100 (%) によって計算して求めた。結果を表

燃焼時間 (hr)	1	2	3	5
燃焼除去率 (%)	51.2	50.8	52.5	51.6

燃焼時間 (hr)	7	8	10
燃焼除去率 (%)	50.9	49.7	51.7

【0037】比較例1

排気マニホールド外部の排気管の後方(下流)に第2の

反応部及び第1の反応部をこの順序にて配設し、実施例

1で高活性を示した触媒A-1及びB-1の組み合わせと

触媒A-2及びB-1の組み合わせを用いて、試験を行

なった結果を表3に示す。試験条件は、第1の反応部に

おける燃焼反応温度を除いて、実施例1と同である。

【0038】

【表3】

9

第1反応部の触媒	還元剤	窒素酸化物の還元率(%)			
		165/200	218/250	234/300	反応温度(℃)
A-1	プロピレン	3.2	8.5	15.3	12.6
	プロパン	3.0	8.2	12.6	
	メタン	2.4	8.3	13.0	
A-2	プロピレン	5.7	12.2	16.3	14.7
	プロパン	5.1	13.5	14.7	
	メタン	3.8	11.8	13.6	

【0039】この方法によれば、本発明の方法に比較し

て、第1の反応部において十分な反応温度を得ることが

できないうで、窒素酸化物の還元率が著しく低い。

【0040】

【発明の効果】以上のように、本発明によるディーゼル

エンジン用燃焼試験装置は、ディーゼルエンジンの

排気マニホールドからその外部にこれに連通する二重管

を設け、この二重管の内管を排気管内管とし、排気マ

ニホールドの内部で上配排ガス案内管内に一酸化二窒素

を窒素に還元する第1の還元触媒を有せしめて、第1の

反応部に構成すると共に、前記排気マニホールドの外部

で前記排ガス案内管内に窒素酸化物を一酸化二窒素に還

元する第2の還元触媒を有せしめて、第2の反応部に構

成した点に重要な特徴を有する。

【0041】従って、かかる本発明による試験装置によ

れば、従来の装置におけるように、高温の排ガス(35

0~400℃)が直接に還元触媒に接触することにな

く、しかも、高温の排ガスと燃焼燃焼によって発生する

反応熱を利用して、触媒を備えた第1の反応部との熱交

換によって、必要とする燃焼反応の温度(350℃以

後)を得ることができ、触媒に対する高温排ガス

による直接的な熱劣化が起らず、また、燃焼等が触媒

に付着せず、かくして、触媒の耐久性が大幅に向上す

る。

【0042】更に、第2の反応部において必要な反応温

度が200~250℃であるので、排気タービンの後段

に配設することができ、排気タービンの破損の虞

れもなく、かくして、ターボチャージャー付きのディー

ゼルエンジンにも用いることができる。更に、このよう

に、本発明によれば、排ガス案内管内に排ガスの流れ方

向に前述したように第1の反応部と第2の反応部を配設

して組み合わせると共に、第1の反応部の外周面に燃焼

燃焼触媒を取付けることによって、排ガスの温度と燃焼

燃焼触媒における燃焼温度とを有効に利用しつつ、排ガ

スに含まれる窒素酸化物のみならず、燃料の未燃焼物で

ある燃焼物、炭化水素類や一酸化炭素類等をよく除去

することができる。

【図面の簡単な説明】

【図1】は、本発明によるディーゼルエンジン用熱交換

型燃焼装置の一実施例を示す断面図である。

【符号の説明】

1...ディーゼルエンジン、2...排気マニホールド、3...

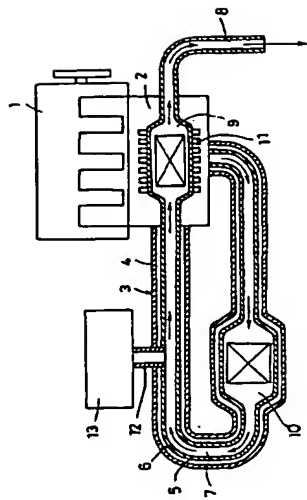
二重管、4...外管、5...内管、6...排ガスの流通路、7

...排ガス案内管、8...排気管、9...第1の反応部、10

...第2の反応部、11...燃焼燃焼触媒、12...還元触媒

給管、13...還元剤供給装置。

【図1】



フロントページの様子

(51)Int. Cl.⁶

F 01 N

3/28

7/08

発明の要旨

F 1

技術表示箇所

(72)発明者 百成 知博

埼玉県蕨市榑原1134-2 株式会社コ

スモ総合研究所研究開発センター内